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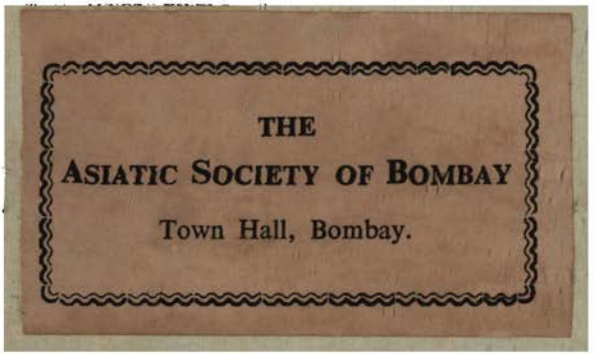

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on 06 November, 2019

SPECIFICATION

OF A

"CINERATOR,"

FOR THE USE OF

BRAHMINS and other HINDOO CASTES who perform their FUNERAL RITES by BURNING,

ALSO

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NOTES ON CREMATION

AND ON

NATIVE BURIALS.

BY

MAJOR THOMAS MARTIN,

4th The King's Own Regiment.

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SPECIFICATION

OF THE

CINERATOR.

"Burning the Dead" having been from time immemorial, a Funeral Rite practiced by certain Castes in India, and one which it would not, from its peculiar adaptation to the climate, be wise to endeavour to abolish; it becomes us to consider how the custom can be modified so as not to prove a nuisance and cause of miasma.

The present mode of cremation is but too familiar to those who reside at, or near populous stations; and it is really time that measures were taken to remove from our sight, the disgusting scenes forced upon us in our daily walks, and to prevent our health, and that of the natives themselves, being affected by the pernicious vapours, emanating from diseased bodies undergoing the process of calcination.

In a country so subject to epidemic visitations as India, there can be no doubt that of all modes of disposing of the Dead, "burning" is in reality the least objectionable, if properly and decently carried out; for the Castes who *inter* their Dead, do not make their graves sufficiently deep to prevent very offensive and extremely dangerous results, which become extensively exaggerated in climes where heat promotes rapid decomposition.

While sanctioning the observance of this long established rite, some plan should be adopted to remove what is so generally, and so justly termed "an awful nuisance," but

which in reality is nothing less than a most deadly poison, the baneful effects of which do not admit of question ;—I have no doubt that if modern appliances be judiciously adapted to meet native prejudices, the subtle poisons generated by the present *primitive* method of creating cineration, would be dispelled *at once*, or at least as rapidly as the noisome Factory horrors have been all over England. The civilisation and consequent enlightenment, which is so rapidly gaining ground through the wonderful impulse given to education, not only by the facilities afforded by Government, but by the extraordinary generosity of influential and high minded natives whose extreme anxiety it is, to induce their countrymen to emulate the most distinguished scholars of Europe, strengthens me in the above assertion ; and there are many I am sure, who will come forward and explain to the people, how much their method is fraught with evil consequences, and induce them to accept a means of fully carrying out their funeral observances "with all their usual ceremony" but with far more decency and privacy, and without its continuing to prove a curse to themselves, their children, and to all those who are compelled by circumstances to reside amongst them. With this purpose in view I have constructed a model of a burning place, or what I term a "Cinerator," in which any number of bodies can be calcined at a time, each independently to allow of the ashes being collected.

The main features of the model are as follows :

1. Double chambers or furnaces are so placed as to face each side of a Pentagon of 40 feet ; from each of the double chambers is a flue for conducting the smoke and gases to the main Shaft or chimney, which, situate in the centre, is 55 feet high and consequently emits the smoke and gases far above the loftiest houses.

2. Each separate compartment of the double chambers is fitted with grates, one opening towards the front and two on the side, under each of which is a place for admitting a draught and for clearing out the ashes.

3. Above each grate is a cradle formed of iron bars parallel to the grate, into which the body slides when the side trap of each chamber is opened.

4. The trap is of iron sheeting 6ft. 6in. by 2 ft, hinged lengthwise, opening inwards and upwards, and fitting the opening in each side wall.

5. The opening in each side wall, commences at 5 feet 6 inches from the plinth of the Pentagon, and is 6 feet long, by two feet, towards the roof, making the height of the side walls 7 feet 6 inches,—all the walls are 2 feet thick, and are built of fire-bricks or other well baked bricks.

6. From the opening at the outer side wall of each chamber, there is a slight internal slope, downwards, towards the first bar of the cradle, to enable the body to slide gently down it, and into the cradle; on the pressure of the weight of the body being taken from the iron trap door, it closes down by its own weight, and is bolted, to prevent any smoke escaping.

7. At the lower part of the opening at the outside of the side wall, is a table 6 feet by 2 feet, hinged to it, and falling outwards rests upon strong pegs let into the wall below the hinges; on this table, the body is laid out, with all the materials prescribed by custom; and, on the table being slightly tilted, the body slides down the incline, past the iron trap-door, on to the cradle under which the fire is burning; the table is then bolted up against the opening which it fits, and serves also to prevent the escape of smoke, &c.

8. To facilitate the placing of the body on the table, there are two steps on each end of *each* side.

9. While the body is being calcined, the doors of the grates should be closed, except to admit fresh supplies of fuel; the fire will thus become intensified.

10. The other chambers, shewing a second plan, are entered by means of an iron door 4 feet by 2½ feet, and the bodies are here burned in grates, which admit of wood, &c., being piled round each body, as at present, the necessary draught being admitted through the ash holes.*

The roofs of all the chambers are arched to favor as far as possible the combustion of smoke.

ADVANTAGES.

The advantages which this mode of producing calcination possesses, are

1. The fires will become bright almost to white heat, which will obviate the *gradual cooking* hitherto carried on, and produce the rapidity of cinerefaction so desirable.

2. The gases, which under the present system are constantly conveyed to us with the smoke of the fuel, are carried to the height of 55 feet, and there liberated, are diffused in the air so as to become innocuous.

3. A saving of at least 20 per cent of Fuel, is not one of the least desiderata, in a country where steam enterprizes and rail-roads are becoming so general, without a corresponding increase in the supply of wood and fire cakes, the only natural combustible produce, and where coal has still to be imported.

On enquiry I find that according to the present method, the cost of burning a body, amounts to seven or eight rupees for fuel alone; but, during the late visitation of

* By this mode the bodies can be burned on the Ground, and the plan can be adapted to all the Chambers hereafter referred to,

cholera, caused by the crowds of Pilgrims who congregated in our neighbourhood, the price of fuel was considerably raised.

As it may be interesting to many, to know the exact cost of a Hindoo Funeral, in this part of India, I shall specify the items of one of the humbler class.

ESTIMATE OF THE EXPENSES OF A HINDOO FUNERAL.

	R.	A.	P.	
Bamboo sticks.....		14		For making trestle for carrying.
Dungaree Cloth	1	8		For winding sheet.
Twine		2		For trestle
1 Bundle of Kurbie.....		1	6	To place on trestle.
Golal, (red powder)		2		For sprinkling over him.
Flowers..		1		For placing on him.
Saffron		2		For mixing with water to sprinkle over him.
Beetle leaves.....		1		For placing on him.
Earthenware Chattee.....		2		For carrying fire in to light the fire with.
Piece of Gold or Pearl		8		For placing in his mouth.
Sandal Wood		1		For burning him with,[according to his means]
Rice, Ghee, Flour of Wheat.		4		For dropping on the road, and tying some in clothes to burn.
Firewood	7			For making, and increasing fire.
Oil or Ghee for fire.....	1			
Pansuparee, dried dates, cocoanut, fruit and dol...		8		For friends.
3 copper pice			9	To tie in his clothes.
Total Rs.	12	7	3	

The Brahmins, the Priests of all the other Hindoo Castes who burn their Dead, have peculiar observances which render it necessary that a separate place be allotted to them.

The stricter Brahmins require the ashes to remain three days on the spot where the body is burned, others again consider one day sufficient, but to comply with the wishes of the former I have set apart one side of the Pentagon for them, merely to shew how *one* shaft can be used for several castes without objection.

It would of course be preferable in populous towns, to have a separate shaft and chambers, for each of the four classes into which all the castes could be divided for funeral purposes, adopting either of the plans I have modelled. If funds would admit, they might all be made according to the plan I have constructed for the Brahmin caste, which would allow of *ten* castes, if required, being separately and privately accommodated at each shaft, without dividing into classes; reserving the other furnaces for times of epidemic when speedy disposal of the Dead becomes a matter of vital importance.

Has it occurred to any one to remark, the difficulties Hindoos labor under, in kindling and keeping up a fire during the rainy season?—The unfortunate Mourners are often kept, in the drenching ceaseless rain, engaged in vain attempts to excite a flame; and, after hours of disappointed endeavours, are reluctantly compelled, at last, to throw the body only partially scorched, into the river where it putrifies and breeds pest!—this is a fact any one can witness during the Monsoon. On the sea coast this is not quite so objectionable, but is a most undesirable *extra donation* to the "Pool," or to any other river supplying drinking water to the Million. A few, I believe, still retain the custom of requiring the ashes to remain for a day or two, on the spot where the body was burned; but, by burning in the open air, during the monsoon, this custom must be frequently infringed; whereas, by using the "Cinerator," the ashes can be retained for that period, if absolutely necessary.

Hindoos, with few exceptions, follow the same rites and form, as it were, one Great Brotherhood; if any proofs were wanting to show the beneficial results which education *is* producing; their having become sensible of the evil effects engendered by their present mode of burning, and their evident anxiety for any improvements which, while carrying out their customs, will lessen or remove the nuisance; are not amongst the least important.

I now proceed to specify the plan for Brahmins.

1. One side of the Pentagon is projected 80 ft, and at right angles to the shaft are a series of vaulted chambers 10 feet by 7 feet, in each of which are two furnaces each $3\frac{1}{2}$ feet wide and 7 feet long with a passage between them of 3 feet—the front wall of the chambers is 6 feet high, having an entrance into each chamber provided with an iron door $4\frac{1}{2}$ feet by $2\frac{1}{2}$ feet—at the base of this wall are draught holes $1\frac{1}{2}$ feet by 1 foot on each side of the doors where the furnaces are.

2. The arch of each chamber has an upward slope of one foot, towards the back wall; and an aperture in one corner at the top side nearest the shaft at the back wall; through each of these apertures the smoke passes in a slanting direction by means of small chimneys, fitted with traps into the main chimney, which, sloping towards the shaft communicates with it, thus ensuring a thorough draught.

3. The main chimney slopes down, from 18 feet up the shaft, to 9 feet at the end of the chambers, and is supported on the projection of the back wall.

4. On the other side of the back wall are similar chambers unconnected with those I have described.

5. The furnaces are composed of an iron grate below,

and a cradle of iron bars in which the body is placed, with fuel on each side of it and also above and under it, besides which is the fuel in the range below.

6. Thus two bodies can be burned separately in each chamber.

There is a custom some Brahmins have, of walking round the spot, during the time of burning, and sprinkling water on the ground. To enable them to perform this ceremony, some of the chambers could be made with passages round them, according to the plan already described, *(see note page 4, and see plan.)* I have explained this to many of the most influential Brahmins and they have approved of it, and of all the arrangements for the other castes.

7. The number of chambers on each side of the back (or centre) wall, can be multiplied to any extent; there are only ten chambers shown on this face of the model containing twenty furnaces.

8. Round the projection of this side of the Pentagon is a wall, 5 feet high, enclosing the whole space; a door-way leads to each side of the building, and thus each side becomes perfectly distinct from the other, the centre wall of the building being the partition wall.

9. If required, rows of chambers could be built all round each enclosure wall, and a chimney made to communicate with the shaft or with the main chimney of the centre range.

With such a system of chambers on each side of the Pentagon there would be accommodation for the requirements of a large population, and in course of time wealthy Hindoos would apply for leave to construct private family Cinerators within the sacred enclosures, as is our custom

with regard to family vaults in England, but as we have to pay enormous fees for the privilege, all that should be required at their hands would be to erect at the same time, *one* double chamber for the use of the poorer persons of their caste, the cost of which would be comparatively trifling.

Thus when fairly started by Government, aided by Municipalities, the number of chambers would gradually increase, and if a small fee were charged for each funeral, a measure which the great reduction in the amount of fuel required would fairly justify, the place could be kept in thorough repair.

Have we not also reason to hope, that the same beneficent feeling of charity, which actuates so many to emulate the deeds of a Sir Jametsetjee Jeejeebhoy and a David Sassoon, will induce some to turn a thought towards this *new plan* for dispensing incalculable blessings to all around them; for he who removes a cause of plague or other sickness, does far more than erect hospitals, *he keeps people out of them!*

All these Cinerators should be under the supervision and protection of Government, as all our own Cemeteries *are* all over the world, and shops for the supply of fuel and all other requirements connected with Hindoo funerals should be established near each, which would obviate the necessity of having to go to distant Bazaars, and thus cause delay; much in the same way as sculptors, undertakers, and other such establishments are to be found near all our burial places in England and as they are also at "Père la Chaise" in Paris and all over the continent of Europe.

EVILS OF THE PRESENT SYSTEM.

To form an idea of the horrors we inhale while funeral

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Pyres surround us, I shall now attempt to shew the products of each constituent portion of the human body, and briefly describe the gases which are afterwards formed by their being simultaneously subjected to the action of fire.

The human body is composed of bone, muscle and fibrin, brain and nervous matter, blood, water and other ingredients which it is not necessary to enter upon here.

Now if we look to the chemical analysis of the different components we shall find their special constituents variously composed as follows :—

BONE (according to Middleton, 100 parts.)

Animal matter	33·4
Phosphate of Lime	51·1
Carbonate of Lime	10·3
Fluoride of Calcium	2.0
Soda and Chloride of Sodium	1·6
Magnesia, wholly or partially as Phosphate	1·6
Total	100·00

MUSCLE (according to Bersilius, 100 parts.)

Fibrin	15·8
Gelatin	1·9
Albumen	2·2
Water	77·17
Extractive matter, with Lactate of Soda and other Salts	2·85
Phosphate of Lime and Albumen	0·08
Total	100·00

BRAIN [contains according to Vanquelin, 100 parts.]

Water	80·00
Albumen	7·00
Red and white fats	4·62
Osmazone	1·12

Phosphorus	1·5
Acids [fatty and others], Salts, Soda, Potassa and Lime in combination with Acids, Sulphur	5·15
Difference and Loss	0·61
Total	100·00

BLOOD, (contains according to Lecanu, 1000 parts.)

Water	780·15
Fibrin	2·10
Albumen	65·09
Coloring Matter	133·00
Crystallisable fat	2·43
Fluid fat	1·31
Extractive Matter of uncertain Nature soluble in both water and alcohol	1·79
Albumen, in combination with Soda	1·26
Chlorides of Sodium and Potassium; Carbonates, Phosphates and Sulphates of Potassa and Soda.	8·37
Carbonates of Lime and Magnesia; Phosphate of Lime, Magnesia and Iron; Sesquioxides of Iron.	2·10
Loss	2.40
Total	1000.00

The result of the application of fire to the human body, then, is the union of the particles of different substances by chemical attraction and the formation of *new* compounds, thus :—

BONE will chiefly produce when burned

Water, Carbonic Acid, Carburetted Hydrogen, Phosphoretted Hydrogen, leaving an ash containing Phosphate of Lime and other Salts.

MUSCLE will produce when burned

Carbonic Acid, Sulphuretted Hydrogen, | Carburetted Hydrogen, Phosphoretted Hydrogen, Water in form of vapour, &c., and it leaves a residue of Phosphate of Lime and other Salts forming the ashes.

BRAIN will chiefly produce when burned

Carbonic Acid,	Carburetted Hydrogen,
Phosphoretted Hydrogen,	Sulphuretted Hydrogen,

Leaving an ash of "Salts of Lime," &c.

BLOOD will produce when burned

The same results as Brain, leaving besides the same kind of ash, iron.

From this conclusive evidence it has been established beyond doubt that the Salts of Phosphorus are decomposed, and new combinations with Oxygen are formed evolving the deleterious compounds known as "Phosphorus Acid;" and in like manner from Sulphates and Carbonates are produced the poisonous sulphurous acid and the no less detrimental carbonic oxyde and carbonic acid gases,—all of which are positively asphyxiating to man.

Besides these combinations with oxygen others are formed with hydrogen and the well known obnoxious sulpheretted, phosphoretted and carburetted hydrogen gases are amongst the ultimate products of this combination.

These highly poisonous gases, which as things are now conducted must mix and be breathed by the population, would be rendered comparatively inert when carried to the height of 55 *feet by the tall chimney of the Cinerator.**

During the present process "burning" produces many horrible evils, while others are engendered by "boiling," a part of the proceeding which lasts as long as any fluid remains in the body, and when we consider that more than *two-thirds* of our bulk is water, a prodigious amount of boiling must naturally take place before complete combustion ensues—it is during this period of bullition that much essence of corruption is emitted, and mingling

* Note.---This from Medical opinions.

with the smoke of the fuel is conveyed to us by every breeze; and when combustion sets in we have all the additional pestiferous results above referred to, combining all the elements most detrimental to the principles of life.

During the late epidemic who has not noticed, more or less, the effluvia arising from the cause referred to? We were prone to attribute it to "brick kilns," but there was no disguising the real cause, it was but too evident.

There would be little advantage in applying the lately invented Smoke-consuming Apparatus to these chambers, as the main object to be attained is to prevent the escape of noxious gases at a low level.

Such apparatus merely consume the carbon and the inflammable gases produced.

It is for the above reason that tall shafts are still necessary in foul-gas producing factories, otherwise the carbonic acid gas, &c., would if confined soon accumulate and force their escape through the ash holes and grates, or if they found no egress explosion would result.

Carbonic acid ($C O_2$) extinguishes flame, and when passed through red hot charcoal produces carbonic oxide ($C O$), which burns with a pale blue flame reproducing carbonic acid.

Carbonic oxide ($C O$) is colorless, has very little odor, and is extremely poisonous, more so than carbonic acid; when burned it is converted into carbonic acid.—Why then endeavour to burn the carbonic acid?

Sulphuretted hydrogen ($S H$) burns also with a pale blue flame, producing water and sulphurous acid ($S O_2$), when supplied with abundance of air; depositing sulphur when the oxygen is deficient.

How can air be *abundantly* supplied in a smoke-consuming furnace?

Sulphurous acid ($S O_2$) is quite irrespirable, and produces coughing, &c., &c., and when moisture is present is quickly converted into sulphuric acid gas ($S O_3$).*

Consequently lofty chimneys are as indispensable now as they were before "Smoke-consumers" were invented; because, although we do not see the gases escape, they escape nevertheless; and it is fortunate for us that these shafts are still insisted upon by Government.

I have merely to add, in concluding this subject, that if I have bluntly stated facts, I have also endeavoured to point out a remedy, which if adopted will, at all events, remove one great source of evil.

I shall now venture a few remarks on Native burials.

NATIVE BURIALS.

However excellent our Home laws are regarding interments, those regulating them in India require considerable improvement owing to the rapidity of decomposition; strict measures should therefore be taken to compel Castes who bury their dead to observe greater precautions, their graves now seldom exceed $3\frac{1}{2}$ feet, and many are *less* deep!—here again we are beset with another avoidable cause of virus; thus wherever we turn our enemy meets us either disguised in smoke or otherwise more disagreeably palpable, but all having the same morbific tendency, wasting life or inducing disease! I say wasting life because there is a greater demand made upon healthy gas to counteract gases which otherwise would kill us, and because we are forced to inhale carbonic acid and sulphuretted hydrogen gases in lieu of that which is life giving.

* For further information on the subject see Elementary Chemistry by Fownes.

I think it not out of place here to allude briefly to the causes which create certain effects after burial.

The chief principles of the body are very prone to putrifaction or spontaneous decomposition when in a moist state, and the chief products thus produced are :

Water, Ammonia, Carbonic Acid, Sulphuretted Hydrogen, Phosphoretted Hydrogen, and Carburetted Hydrogen Gases.

The Gas which causes the distension, &c., of the abdomen of a deceased, is probably chiefly a mixture of carbonic acid and sulphuretted hydrogen, which if freely inspired would cause asphixia and death, and if inhaled in a less concentrated form, will produce nauseau, vertigo or syncope, lasting for some hours, and followed by trembling of the limbs.

The earth soon becomes impregnated with noxious exhalations, and any hollows become filled with carbonic acid gas, which is the poisonous gas to which so many fatal results on record have been attributable.

Taking these stern facts into consideration, and knowing that carbonic acid gas, in its primitive form, is heavier than atmosphere, I shall endeavour to account, in a practical way, for how in this climate it is more readily brought to the surface, than it commonly is by the laws which regulate the diffusibility of gases.

When the ground is slightly moist it is better able to retain the gases engendered by decomposition, and to confine them in the accidental cavities below where they have accumulated ; but in this country, where the periodical fall of rain is so constant and abundant, these gases become more speedily combined with water, and are rapidly taken up with the steam, resulting from evapo-

ration, which is so excessive in India; moreover, the ground being saturated, becomes heavy; and sinking, fills up the cavities, and compels a more speedy union of the gases with water, which the latter will take up to an extent equal to its own bulk, a fact well known;—reaction ensues, and the gases being liberated at a low level, the air we breathe thus becomes surcharged with their poison.

On the other hand, during the dry season the ground becomes creviced to a considerable depth; and a draught being thus created under ground, the abomination is thus also forced to the surface, and the object of burying is neutralized.

There is another and a far more disgusting cause which facilitates the escape of the gases, viz., the Jackall and Pariah! whose burrowings are made easy by the shallowness of Native graves, and bones usually mark the spot where the Mausoleum *ought* to be.

No one can deny that thus burying the dead is nothing more or less than poisoning the living!—and I shall now proceed to shew how interments should be performed, and point out how the venom can be reduced to a minimum, by a few simple precautions, and with very little extra expense.

1. Grave yards should be established at a distance from the town, in a contrary direction to the prevailing winds, and portions told off to certain Castes.

2. A number of undertakers and gravediggers should be appointed to each grave yard.

3. The undertakers should be duly licensed for districts, and compelled to keep on hand a certain quantity of deodorizing carbolic mixture, which costs only Rs. 5 per *cwt*, and quick lime, to meet contingencies in case of epidemic.

They should be held responsible that the gravediggers make the graves at least 7 feet deep.

4. It should be the undertakers' especial duty to place in the coffins, on the body and at its sides, a certain quantity of the deodorizing mixture (say 10 lbs.) before closing it; or, if there be no coffin, 15 lbs. of the mixture should be placed on the body; some earth should be packed on each side of the coffin or body, in the grave, and a layer over it; then a bushel of quick lime, and some sand or gravel should be thrown in, and the grave filled in and well rammed; no new grave should be opened within 4 feet of that grave for 5 years at least.

Consequently when the body decomposes, the deodorizing mixture and lime will counteract much evil, and the lime and sand will cause the earth to harden over the coffin or body. Lime kilns should be established for this purpose in each cemetery.

5. Undertakers should be subject to heavy penalties for neglect on their part, and no Native interment should be permitted without being registered, and superintended by an undertaker, who should be granted a scale of legal fees.

6. Any Native who neglects to report a death within the legal time to the undertaker of his district, should be subject to fine or imprisonment, or both.

7. The Health Officer should be granted magisterial powers in these matters, certain well defined laws should be framed for his guidance, and no appeal allowed from his decision; he should consult with the Presidency Sanitary Commissioner or Deputy, to determine upon the most favourable locality in which to establish cemeteries, and he should be held directly responsible to Government for the due carrying out of all sanitary measures connected with this important department.

Is it possible to deny that fevers and other diseases engendered by a mephitic atmosphere, and to which all densely populated Native towns throughout India are so pre-eminently subject—and for which they have acquired such wide spread notoriety as to cause them to be avoided with horror by all who can afford to shun even their neighbourhood—are not attributable to a lack of proper sanitary measures in this particular as much as in burning, drainage, conservancy and ventilation?

Let us therefore hope that the endeavours of Government will be ably seconded by both Europeans and Natives, who, having at least this cause in common, will find it their best interest to work together, in bringing about these much needed reforms; the former, by introducing all the improvements science has taught them; and the latter, by doing their utmost to remove fanciful objections which, if persevered in, will perpetuate the filth and disease they have hitherto *lived* and *died* in; whereas, by a few simple sanitary precautions, the evils I have referred to would be removed; and, with God's blessing, we might see the rising generation growing up a hardy and healthy race, to bless the wisdom and enlightenment of their fathers in rescuing them from a life of dirt and disease, and from premature death!

T. MARTIN,

Major 4th K. O. Regt.

Poona, 1st March, 1864.

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